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2D special effects on the Genigraphics 100 D+

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2D SPECIAL EFFECTS ON THE GENIGRAPHICS 100 D+
by Jane M. Wood 5/16/89

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Table of Contents

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To my Parents, Vincent and Kathryn Wood, and Family for their many years of love, guidance and support.

Proposal

I propose to research " Special Effects " 2 Dimensional (2D) Illustration and Graphic Design on the Computer. The main emphasis will be placed on complex images. This process will involve multiple exposure of slides or slide merging. Research will be done not only in the area of slide merging, but also in discovering "special effect" techniques and how they can be accomplished on the Genigraphics System. In addition to the slides, 2D application such as posters and/or brochures will be designed to demonstrate the results of the research. The theme of this thesis will be the promotion of computer graphics. It is the purpose of this thesis to move beyond the basics and to expand the knowledge of those who will be using the Genigraphics 100D+ Computer in the future.

Statement

[1]*Design Quality, p.114*

This Thesis Represents " Special Effects Computer Graphics."

" No tool can improve a poor design, but a computer can make a good designer better by making it easier to explore more options more fully." Design Quality[1]

Images were created on the Genigraphics 100 D+ System. The images combine both raster and vector art. They were output at 1000 lines of resolution to 35 mm film. Reversal color prints were made from the slides.

Jane M. Wood
April 29, 1989

Introduction

Computer Graphics is diverse and an ever changing field, competitive and exciting.

"Computers in the 1950's were expensive, slow and unreliable creating mainly simple point plots of numerical data. Ivan Sutherland can be considered the father of real time interactive computer graphics. 'Sketchpad: a man-machine graphical communication system' (MIT Lincoln Laboratory 1962), his doctoral dissertation, set up methodology for computer graphics which gave the subject matter its name and began its evolutionary development. Now the view displayed on the screen was derived from an internally stored model of whatever was being represented. Interactions were between user and model while use of the display closed the feedback loop. The 1970's saw much research which made great advancements in the field. Lines were used to quickly display data (no longer points). Each picture was generated through a sequence of movements and drawn lines, the resulting display was called a 'vector' display because all of the visible effects were composed from lit vectors (line segments) displayed in turn. Next came framestore driven raster displays. The first raster display appeared the late 60's. They were called 'visual display units' (VDUs). The word 'raster' refers to the manner of drawing the picture on the screen. The beam visits in turn every possible position on the screen, scanning row by row from top to bottom, varying spot brightness. The screen is composed of an array of small squares or 'pixels' (from 'picture elements'), each of which can be shown at a separately specified brightness, and color. A framestore is used to store separately each pixel value on the screen. Current technology is improving faster cost effective hardware where pixel resolution can reach 1024 x 1024. Color choice can reach 16 million.[2]

Many challenges remain in computer graphics; emphasis will continue in the areas of reducing imaging time, increasing complexity and available storage location in a cost effective manner. I see a need for "smarter" computers. User interface and interaction will be priorities for future hardware and software development. Demands will be placed on computer graphic development until it reaches a level of cost effective ease and spontaneity. I hypothesize that with increases in memory for storage location and operating needs (i.e., optical disk) computers will become more "human like" and much "smarter." The screen view will appear "life like," 3 Dimensional (3D) animation will be in real time, and audio interaction will become universal.

[2] *Annabel Jankel, Rocky Morton, Creative Computer Graphics (Cambridge: Cambridge University Press, 1984), p.18-22.*

Research

In Preparation

The best part of computer graphics is the visual impact it has on the viewer, whether it is general computer graphics information, simulation or commercial marketing. The first stage in the development of my thesis was very pleasurable. I decided to collect as much current visual information as I could find. Sources for this were found leafing through numerous magazines and other industry publications. The best applications that I found were ads for the Computer Graphics agencies, and or services (software, hardware, and "image makers").

I spent initially five weeks on research for this thesis. Other related topics besides the subject matter of computer graphics were studied. Graphic Design sources were essential in providing me with application ideas. It was within these magazines and texts that I found quotes and concepts for my final image.

I also needed to do quite a bit of reading on how to use the Genigraphics 100 D+ System, especially because in this recent software[3] upgrade some of the menu changes were unfamiliar to me. I needed to review usage and parameters of the camera, paint, and file management procedures.

Text books on computer graphics provided historical background especially in the technological advancements behind the imagery. Most of the imagery from these sources were generated by the computers and their programmers, not necessarily by visual artists.

[3] 100D-Plus™ GVP Design Software, January 1988, Genigraphics Corporation, Liverpool, New York.

Thumbnails

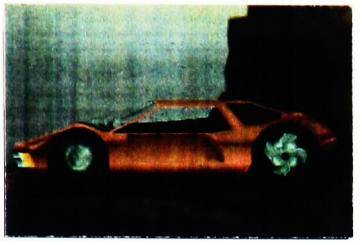
Initial Imagery

My goal in developing special effects on the Genigraphics 100 D+ was to see how it could produce similar and /or better imagery than what had been done previously by other computer graphic professionals using other skills, techniques, and equimpment. I took notice of pictures with special effects. Sometimes I roughed out little thumbnail sketches of the basic idea, composition or elements that composed an image. These sketches and original images provided initial concepts for my "special effects" imagery. I set a goal to aim for at least twenty images. I chose to keep these images rather simple so as to focus on"special effects"goals.

While studying all of these reference pictures, I wrote lists of subject matter that might enhance or support certain desired effects. Some imagery that suggested computer graphics to me were: grids, checkerboards, floating shapes (spheres), and shadows. These idea catagories were chosen out of many: car, metallic head, columns, fish , 3D grid, watch, globe, cube, marble, pyramid, rose, bubble, mirror, teapot, and linear patterns. Often I worked in pairs of two related themes (i.g., fish-dolphin, grid-linear grid, linear shape-linear pattern).

It was at this point that I shared my ideas with my Thesis Committee. Their feedback was very helpful in guiding me to continue with the twenty special effect studies and in directing my thinking towards final processes. These studies were and continue to be in a state of revision. They provided me with a base structure for my final piece and with an orientation to the 100 D+. Without having worked through so many different kinds of techniques, imagery and effects, I would not have accomplished my final imagery so easily, nor would I have learned as much.

Note: In reading this section refer to the Appendix (A p.#) for explanation of the Genigraphics 100 D+ terminology and functions.



Car

[4]*Artist's Sketch David J. Wood Norfolk, Virgina, 1989.*

[5]*Beny Roloff, In Italy (NewYork: Harper and Row, Publisher, 1974), p. 3.*

Metallic Head

Special Effect Studies

Car

A car would show off both reflection and transparency. For my first image I decided to use the camera to grab a black and white sketch of a car.[4] This information was digitized and stored as a raster image on a canvas. I then worked in the vector display area of the software to create shaded contours and components of the car. Odd shaped point to point shapes are difficult to space and size increment due to the arrangement of the vertices. (A p. 27) After the object art was created I decided to place it into a background which was grabbed and placed on a canvas.[5] My work was now entirely a raster image. I could take all of the paint capabilities and change an individual pixel's color to give desired effects. I had planned to set this image into this mode of working primarily to get the windows transparent and to smooth out some areas of the image. Improvements to this image were needed in further refinement of the "transparent" windows, light source direction, and in the wheel's curves. Shadows helped to make the car look as though it was really parked there. It has always been difficult for me to render cars with non computer techniques. I was pleased that with the help of the computer it was relatively easy to create a believable image of a car.

Metallic Head

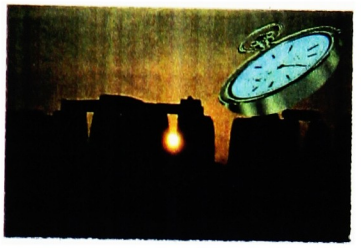
The next image that I worked with was very unsuccessful, but it provided many learning experiences. I was attempting to shape a head into a metallic looking image. To do this I grabbed a slide image of myself with the video camera and proceeded to create vector objects over the top of this image (same process as the car). My initial studies involved much time learning about simple machine commands and ways of setting up images. I struggled to get the object art composition done. I then worked with color and changing the color into grays. The entire file was converted into pixels when sent back to a canvas. I spent numerous hours trying to "air brush" and paint reflections into the image. After some time, I managed to obtain a soft "plastic -stone" look . However the crisp sharp object shading and subtle darks/ highlights in a reflective metallic object were not obtainable working with this raster image. This was due to the fact that the brush size could not be made into one pixel. The smallest size was a brush composed of four pixels which could not give me the high contrast hairline shading qualities needed for metallic reflection. I did however develop my own technique. It basically works as follows: first I used the smallest square brush (4 pixels) at intensity 64 to make swirled dark lines; next the middle bright circular blend brush at intensity of 6-17 for

Comprehensives

6 *"About Time," Champion Imagination 24 Champian International Corporation, pp. 5, 13. (Paper Sample).*

general gray, purple, and blues; then the smallest white blend brush at intensity of 6 to set a bright highlight next to the black swirl lines; and then back to the middle bright circular blend brush to smooth out the blending.

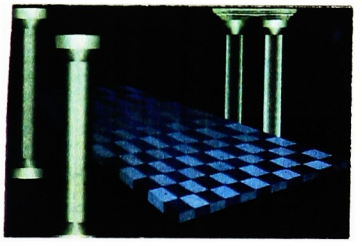
Watch



Watch

In contrast to the previous image my next file was one of my more successful images. I decided that a "flying watch" could be an image worthy of a computer graphics approach. The themes of time and space are compatible concepts. Instead of a flying space craft I decided upon a watch. My visual image information was grabbed from a paper sample book.[6] I had intended to experiment with multiple exposure imaging. This was originally to save object/color space on large files. (A p. 26) Later I discovered its usefulness in film recording resolution quality. This image became my prototype for the multiple exposure process. The first attempt was unsuccessful but later attempts worked beautifully. Other difficulties involving this image were seen in the watch base built with vector art. Curves are always difficult while working in point-to-point shapes. On the whole the visual appearance, colors and theme made this a very strong visual statement. To further refine this image for my final piece, I used a raster panel shading technique. See page 19 for a discussion on this technique.

Columns



Columns

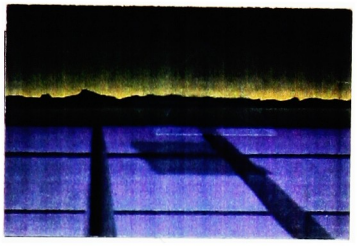
Image number four was a study in 3D grids and in columns. This file, along with the previous files, kept challenging me to recall and improve my work habits and ways of composing images. While working on a 2D system any 3D appearing information is entirely illusion. What I mean by this is that the z axis does not exist; therefore, perspective, shadows, foreshortening and other techniques are used to provide the illusion of 3 dimensional depth. The difficulties that I encountered while working on this image were the time consuming hand building of the grid, in visually spacing the grid increments. (A p. 24)

Dolphins

Dolphins

Upon viewing techniques in computer graphic scientific imaging I decided to emulate the appearance of plastic surface convolutions. The air brush was well suited for soft shadows and diffused highlights. These flowing surfaces reminded me of the ocean and jumping dolphins. From my research sources I've noted that fish and even dolphins are not uncommon computer graphic themes. The image was started with a line drawing of

jumping dolphins. I then constructed strips resembling a billowy flag or bands of ribbons. The dolphins were not separated from these surfaces. I wrapped the object art visually around the wire frame line sketces to form their bodies. The next stage in this image's development was to transfer the object art into pixel art. (A p. 27) I used the paint menu to continue refining the surface effect. This was successful in creating depth and a flowing surface. One last attempt failed to set up a sharp looking multiple exposure. This was because of the masking of the anti-aliasing on curved shapes which results in black outlining. (A p. 26)

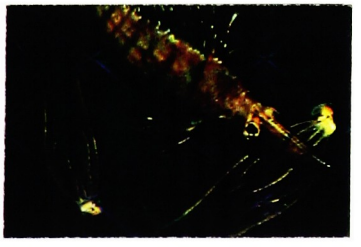


Pyramid

Pyramid

I spent the most time working with this image. My intentions were to create a transparent object. I decided upon a floating pyramid. I started with a point to point outline of the pyramid, created a vector object of the shape and placed it on a background created in object art. I transferred only the pyramid into pixels. I then used the paint menu to obtain a see -through "glass" pyramid. I painted some low intensity white over the pyramid so it would not look totally transparent. This image was moved back and forth from pixel art to vector many times. The lines where the planes met were drawn in vector. When they converted into pixel they became stair-stepped.

All along while working I was trying always to conserve space on each image so as not to run out of color space or object room. Due to this conservation many portions of the shaded object art appeared to be banded. If I wasn't restricted in file space, I would have shaded these shapes with more objects per shape to gain continuous smooth shades without any banding. My final technique (discussed on p. 19) allowed me to recreate this image with very smooth gradations. Final revisions included a total change of banded vector art into panel art. I had to again go through the procedure of sending everything back to a unified pixel format, paint the inside of the cube background colors, paint out the "pixelized" vector lines, and later draw white lines to represent the sides of the pyramid. This process was worth redoing. I managed to correct many things about some of my previous files. Due to the new use of so many finely shaded objects the color tone changed into lighter smoother gradations.



Net

Net

This image provided an interesting contrast to solid vector object shading. I decided to experiment with lines. I set up an eight line module, duplicated it, then flipped and flopped the new module until I created a net or web-like structure. I did some color selection but decided to leave it in a cool range of vibrant colors. This reminded me so much of a fish net or even a star

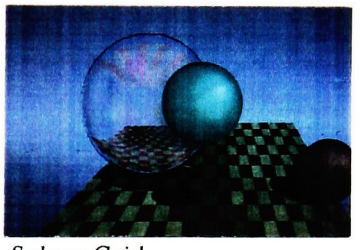
fish that I decided to place fish with in the image. My source for the visual images used excellent color photography.[7] I grabbed fish and silhouetted the images by painting black (clear) around them. I accidentally discovered that the wash function would wash vector art over a canvas. The net image from the display had washed directly over the pixel image of the fish. I could use this effect to make the fish look caught in the net. (A p. 28) I also used multiple pages to my advantage. I placed the octopus on page one on top of the net image, and at the same time it appeared underneath that portion of the net located on page two, hence, another weaving technique. Due to the excellent source photography of the fish images this became a quality image.

[7] *Christopher Newbert, "Within a Rainbowed Sea" (NewYork: SD Warren Company, 1985), p.2.*

[8] *Melvin Pruitt, Art and the Computer (NewYork: Mc Graw-Hill Book Company, 1984), p. 21.*

Sphere Grid

My next challenge was to create a transparent sphere that would show reflection. I set up the composition based on a famous computer graphics image.[8] I assumed that I would focus on achieving this interpretation rather than on composition or on a new arrangement of elements. The most time consuming portion of the image was again structuring a 3D grid. I used the same procedure as with the last grid: first starting with a wireframe base then creating woven bands of lines and then placing squares on top of the intersections. The idea is to have the squares get much smaller and closer together as they receded into the background. After making the grid I created three floating spheres as my picture elements. The largest sphere was shaded to match the background colors. Another (reflective) grid was hand built on top of the transparent sphere to show curvature. Later the sphere was transferred to pixel art and reflections, etc. were painted on it. Thirdly, on the display, (A p. 25) the grouped grid that was inside the sphere was flipped and washed back into the pixel art. My greatest difficulties with this image, aside from grid creation, were my attempts to multiple expose the paint and vector art at different resolutions (Again as with the Dolphins black lines surrounded the curved shapes) (A p. 26).



Sphere Grid

[9] *A Golden Hands Book, The New Rose Book (London: Marshall Cavendish , 1973), p. 35.*

Roses

A rose would most likely not be considered computer graphic imagery. Roses are one of my favorite flowers. Their many varieties provide a wide range of color choices. The special effect goals behind this image were to create glass vases containing roses. I was fortunate to have experimented a little with the filter on the camera. I set up an experiment to grab the rose using different color filter ranges. I used the same rose digitized from a photo.[9] The first color filter combinations were R-8, G-0, B-0, creating a vibrant red rose. The second created a yellow rose using, R-8, G-8, B-0. The third was pink, just as it

Roses

appeared in the photo. For that I used the default setting at, R-8, G-8, B-8. Vases were built out of point-to-point shaded objects.[10] I then sent all of the information into raster art so that I could air brush in a "glass look". My first attempts at this image made the roses look plastic, and the vases look pewter. However, redoing the paint effects and using a finely shaded background produced not only a glass look but a better looking image.

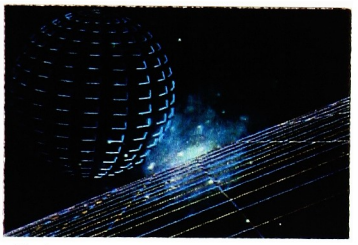
[10] *Melvin Pruitt, Art and the Computer, (NewYork: Mc Graw-Hill Book Company, 1984), p. 145.*

[11] *Ibid., p. 154.*

[12] *Ibid., p. 11.*

Galaxy

I became intrigued with a linear grid that I saw.[11] Also, I noticed a globe created from angled lines.[12] I wanted to create an "outerspace-wire frame" type of image. I researched and found photo reference for a galaxy. The difficulties in this image were again the time it took to draw up the globe and grid. I used a grabbed photograph like a template, especially for drawing the globe. The grid was drawn flat and then tipped up at an angle. Next, I found a galaxy in a book.[13] I tried a grab using only the blue filter; however, the chroma became too high and it did not shoot light enough on film. One of my later revisions to this image involved grabbing a new galaxy.[14] Finally, the last image was just a matter of color adjustment on the globe. The globe was drawn "haphazardly." I could have pre planned the order in which the pieces were drawn to obtain correct shading for light sources with using just the space color function. (A p. 28) To correct for this type of "automatic" highlight effect, I could have used the overlay function to rearrange the order in which the objects redrew, which in turn would reorganize the way in which the space color function occurred.



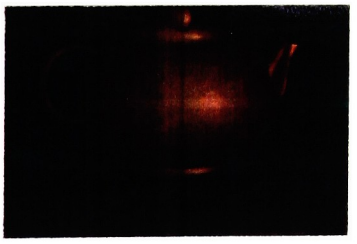
Galaxy

13Hans Verenburg, Atlas of Deep Sky Splendors, (Cambridge: Cambridge University Press, 1983) p. 150.

14Michael Freeman, (Photographs) "Galaxy" Smithsonian, Vol.19 No.10 (January, 1989), pp. 50-52.

Teapot

Teapots are special to me because my mother, a potter, creates many teapot designs. This year computer graphics teapot images are a theme at the SIGGRAPH '89 Conference in Boston,[15] so I decided I would submit this image to the contest as well. I created a teapot for an animation file which was created prior to my thesis work. I decided to use this as base art work on which to build. In the animation file the object art teapot was very small and very simple. I had to keep adding more objects to each area to create smooth gradation effects. I also had to create a new handle, spout, and top. After many revisions I finally arrived at adequate shading values. My favorite part of the image was the table top on which the pot sat. The special effects used were to wash the teapot onto a canvas that already had a grabbed marble background. This background contained a previously washed image from the vector art created in the sphere grid file. I then created on the display, in panel art,



Teapot

15 ACM SIGGRAPH '89, Pre-Conference Promotion, Chicago, Illinois, 1989.

tiles tipped back in space. I placed these tiles on top of another panel washed with a gradation onto a marble image. The significance of all of these wash effects were to create subtle appearances of gradation and objects "fused" into raster art (reflections/shadows). Washes can be done at various levels of intensity. (A p. 28) This seems to me the only way to relatively quickly change color on all or part of a canvas within the confines of a defined shape without painting with a brush, or cutting and pasting from the display. I found this fun to experiment with and a very useful tool. I went so far as to set up another composition using just a washed pot as a silhouette. The final image was obtained with more revision to the object shading and further wash effects, such as the reflection of the pot. The reflection was created by "washing" over a duplicate pot flipped upside down and moved under the teapot.

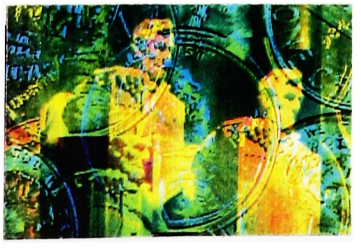
Transparency

Using the teapot file I cut and pasted from one canvas onto another canvas. Repeating this again and again I was able to obtain an interesting transparency effect. However, the image due to previous wash techniques became very dark when it transferred to film.

Lincoln

Lincoln

Upon my great need to keep revising images, while continuing to create new images, I discovered some interesting camera techniques. I had planned to enhance my file that contained the grids and column with some special effect grabs of Lincoln. This changed because I was creating such interesting images that I decided to keep experimenting without combining files. I grabbed the same image using different filter ranges, and sometimes, grabbed over grabs at both different filter settings and sizes. The effects were very "painterly" and visually interesting. Some of the colors ranged from dark brown and blue to pastels. "Posterization" of the actual image occurred in degrees, meaning that using lower filter settings, I got a higher level of posterization, hence, a loss of detail. I further experimented with sizing up and down in the raster art and then transferring it to vector. If I sized it down on the canvas to approximately 1/4 inch square and then transferred it to the display increasing its size to 4"x 4", I would be viewing on the screen a "pixelized image", an image composed of squares that were very visible to the eye. The pixel size varied and so did image quality. The results of this pixelization process were evident on the screen but did not shoot well during pre-recording. (Ap. 27) The end results were fuzzy and very out of focus.



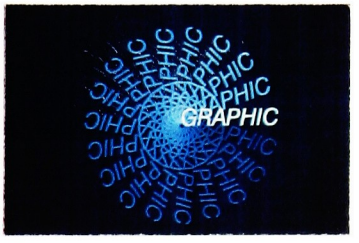
Lincoln-Pennies

16 Rotational Font Special Effects, Software Update, February, 1987, Genigraphics Corporation, Liverpool, New York.

Pennies

Pennies

What image could be compatible with Lincoln besides columns ? — pennies! I was able to place a handful of pennies directly under the camera to digitize. I had wanted to experiment with some actual 3D objects. For this image I did not spend any time on the composition because my goal was to experiment with the grabbing process. I captured the pennies using many filter range combinations. First I grabbed the whole image, and then grabbed individual sections of it directly on top of the first grab using different filter combinations. I liked this image very much because by using such a very simple process I could obtain interesting color combinations quickly. I did some additional experimenting using canvases containing both Lincoln and penny images. I pasted Lincoln onto pennies and vice versa. Many great effects can occur combing grabs, filter ranges, and cut and paste functions.



Text

Text

My last experiments were reserved for text. I noticed that this area could have been an entire thesis project. I decided not to bother with the thumbnail sketches in my note book, but to attempt to get the rotation text effects to work. When I first started this visual work I tried some font rotation special effect programs.[16] They didn't seem to work and I could not figure out why. With a little luck I noticed that words of seven characters rotated under twenty times did not take up all of the memory model allotted for each file. If the memory models were not used up, then the font rotation programs worked very easily. (A p. 26) I did experiment even further with space color and distortion. Take note that when width and height are not proportionally scaled, letter forms become unrecognizable. Also, results from haphazard scalings and re-rotations are very unpredictable. My last experiments in the area of the text was to transfer rotation text to raster art then transfer it back to vector art as a movable, distortable object. If time permitted, I would have liked to have done more experimenting in that area.

Text

In summary: I was very glad to have done so many images with such a wide range of experimenting. This gave me an in-depth understanding of the software, and machine's advantages and disadvantages. I was also fortunate to have been able to shoot slides showing the development of my thinking and image stages. I found the use of both raster and vector imaging to be a fantastic way to obtain just about any desired special effect. I did not use the multiple exposure process as much as I had originally intended, but was at least able to successfully achieve the exposures. Lastly, I greatly enjoyed using the camera filter options and the wash techniques to obtain controlled paint manipulations.

Applications

It was now time to start final application decisions, and decide what to do with the previous twenty (plus) images. Some of the twenty needed minor revisions and others just weren't worth continuing. I, therefore, chose eight images that could be show pieces. I wanted somehow to build my final show pieces from the imagery that I had been working with all along. In addition, all of the new techniques were to be used as well. I had previously decided upon a 2D "print" application with text. I had thought that a poster with design quotes would be manageable. A vertical panel composed of four slides seamed together would certainly not cause gallery space problems and, yet, would suffice in proportions for a poster.

Final Poster

I had to ask myself how I might effectively use the best parts of my previous images. In reviewing everything I noticed a theme that could very easily exemplify many things from my experiments. My images contained settings ranging from underwater to outerspace; therefore, why not create a poster with that same theme. Panels would go from water, to land, and then to space. I could use my net, fish, columns and globe images from previous files. With this type of wide ranging theme I could place just about anything relevant to "computer graphics" in the poster. Rough concepts were very quick to sketch out so the whole project went very fast. I didn't have time to make comprehensive sketches because I could easily work directly on the computer. I decided to work as quickly as possible with each panel. To do this I started building base ideas and kept adding things until I felt the composition was how as should be. To my chagrin, my two week deadline was extended to three, plus further revisions amounting to an extra week. My rush for a quick completion was to make sure I had enough processing time for the show pieces. If problems arose I knew I'd need a time cushion. I came to realize that with my current technique I needed to do some revision towards the completion of files because my color space kept filling up. (A p. 25) At this time I was aware only of deleting objects from shaded gradations to eliminate these problems.

Fish

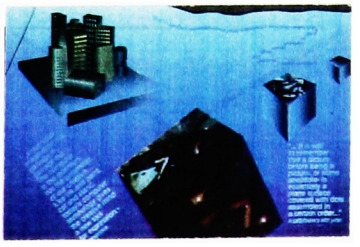
The first thing that I started was to establish a gradational background. In order not to see banding, I decided to use 100 objects. This would take up 100 color locations out of 253. It would also use up 100 object storage spaces on page one. (A p. 25) I then decided to transfer this into raster art and bring it back to the display as panel vector art. This technique worked very

Application

Fish

well with straight edged objects because no aliasing occured in either vector or raster images. A vector panel is stored in only one color slot and as one object, not the original 100. (A p. 27) This was a considerable advantage because vector files fill up quickly, especially in color storage. I also saved the 100 object art gradation as a single page vector file to use again, or wherever needed. (Ap. 27) My next endeavor was to add to this file a previous single page vector file called net. I eliminated some things and changed the remaining group's angle plus its horizontal proportion. To add the fish into the image, I grabbed them by using different filter ranges and proceeded to silhouette each; I then cut and pasted them into a layout arrangement on a single canvas. This helped save raster storage space. I knew all of these files would be loaded with information so I tried to conserve vector and paint storage where ever possible. I knew I wanted to add an anchor to this image. Since I could not quickly locate a picture of one I hand-built an image that resembled what I thought an anchor might look like. Final work on this file consisted of adding art that overlapped from the "Frog" file, and checking the color of the seam area so I could match it with the next file. I was pleased with this image because of some surprise effects. The silhouette on the oyster shells, lower right, used to indicate ocean floor were outlined by white dots which resembled bubbles. These white pixels are again evidence of alias or stair-step on raster curves. (A p. 24) I also liked the point-to-point object shading on the anchor, and the distortion in the net.

Frog



Frog

[17] J.S. Bainbridge jr., "Frogs that sweat-not bullets, but a poison for darts," Smithsonian, Volume 19, Number 10 (January, 1989), 70-74, (Photographs by Robert Noonan).

This file was not so easily accomplished as the fish file. I started out with floating 3D cubes. To gain the correct perspective that I wanted I drew line guides upon which I built the gradational shades of object art. I used images of frogs as panel art for the top surfaces in the two smaller cubes.[17] (A p. 27) At first I did not realize that these panels were considered point-to-point shapes. (Ap. 27) With the four vertices I could position the corners of these panels in any x,y position on the screen. The " justify vertex" function allows me to center these vertices with any other. This made it possible to fit the panel to my pre-drawn and angled cubes. The most challenging part of this image was creating the floating city. I used up all my color space due to attempting to shade with a smooth gradation using as many shapes as possible. I spent the most amount of time on cutting out objects from existing shades to obtain extra color slots. (A p. 25) This constant compromising to obtain the best results possible was very frustrating. Also, while creating each element, I had to consider all additional elements necessary for completion of the image. Just how much room could some

Application

[18]*Video Cassette Demo Reel, Robert Abel and Associates 1985.*

items take up while still leaving space for things to come (i.e., text,seam,other). While working on my fourth and last image I made an important discovery. It already existed in this file but I hadn't realized its existence nor how powerful its effects could be. I will discuss it in detail when talking about the last image (Space). After this discovery I reworked this file to eliminated all of my previous difficulties and concerns. Having adjusted all the problems, I had to add the text. I decided upon quotes selected from a variety of sources (See page 19). I used three quotes on this image due to large areas of background. I wanted one quote to extend down into the next panel, but it would not be plausible with the seam.

Land

Land

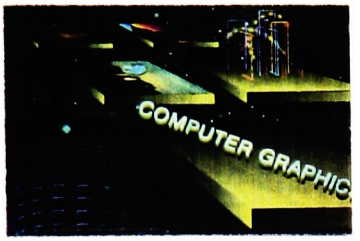
This was the most pleasurable part of the poster on which to work. I think, mainly, because it was more simplistic than the others. I again used the background file from fish yet in this file, I duplicated it to make two separate shades totaling 200 objects and colors. In the top gradation or sky I used the HCV color spread which runs through the entire color palette giving a spread in coloration from blue to yellow. My only worries would be involved with seam match up. The land was created from an irregular object, duped, grouped, and spaced. It contained forty objects. I was pleased with the shading so I continued along to create the windowed sky panel and the mountains. The second sky image was a panel made from the same canvas as the main sky. Both use the same canvas but with different reference rectangle locations and sizes. I later added stars and a little globe. The mountains were composed of four separate simple yet jagged shapes. The monument, or column structure, was hand built from panels referenced to a previous file of grabbed marble. It was very difficult for me to find a sample of marble. This marble was digitized by the camera from a still frame video image.[18] It was an indirect process due to not having available decoding equipment for video signals. (A p. 25) The arch was the most difficult part of the image to construct. The file itself did not take long to create. I used the same globe at the top left as in the "little sky." Size was of concern due to each object in both globes taking up color space. For the time being I made the globe just a single color and moved on to the last file.

Space

The final and fourth panel created was a turning point in my image development. I gained a better understanding of file management and in the advantages of the software used. I was able to discover that to shade shapes with a fine gradation, using at least 100 vector objects, one could send this shading into pixel art, and later use it to construct in the display, panel built shapes.

Application

[19] *Patrick Moore, The Rand Mc Nally New Concise Atlas of the Universe (London: Mitchel Beazley Publishers Limited, 1970) p. 176.*



Space

This was the same process I used to create the marble column. I discovered the usefulness first, of panel/point-to-point shapes, and secondly, of fine raster gradation sent to the display as panel art. The advantages of this technique are as follows: fine gradations are achieved with excellent color spreads, panels can be easily manipulated and file storage space is conserved. This is so because panels take up only one color slot and one object area. At the onset of this file this technique was not in my mind as a solution to my many imaging concerns. Therefore, I did indeed struggle with many vertices especially when creating the golden platforms. For a background I decided to use a galaxy called "Horse Head"[19] Chess pieces are common computer graphics images, especially the horse. With this image as a background one canvas location was already full. I filled a second canvas with images for the bars or platforms. They contained images from previous files (watch, teapot and land) that I cut and pasted in reduced sizes, which pretty much filled this canvas. Now only one canvas was free. I had think about file space considerations mainly due to using many objects which used up too much color storage. (A p. 25) I would need much more room for text, etc. The text was the most challenging for me due to the current space considerations mentioned, plus the difficulty in creating text that laid back in perspective. Text can be rotated from 0°to 360°. To get it to look like it was in perspective I would have two choices, either to grab a perspective drawing, or secondly to create each letter as it would be seen in perspective. Neither option would provide me with sharp or correct looking text. What to do? I decided to use a text rotation formula, scale it up, place it on a canvas, bring it back to the display and then tip it back into perspective as panel art. This did not image well due to raster techniques. The text was set up by taking one object from a text rotation formula (which looked like it was in perspective) and then using this object to group, space, size increment, and space color.

Application Quotes

Land

"The sphere and cone and cube appealed to ancient Greek geometers for their mathematical properties, to Cezanne for their artistic potential and to the computer graphics people for both."[22]

[20] *Annabel Jankel, Rocky Morton, Creative Computer Graphics (Cambridge: Cambridge University Press, 1984), p.16.*

Frog

"Imagination in, Imagination out, garbage in, garbage out ... The computer is the extension, not the parameter, of our creativity... like ink and paint, cel and stand, today's computer technology gives the creative mind a new tool for expression."[21]

[21] *Anonymous*

"Graphic Design is essentially about visual relationships – providing meaning to a mass of unrelated needs, ideas, words and pictures." John Kouwenhoven [22]

[22] *Paul Rand, A Designer's Art (New Haven:Yale University Press, 1985), p.xiii.*

"It is well to remember that a picture-before being a picture, or some anecdote–is essentially a plane surface covered with dots assembled in a certain order." [23]

[23] *Ibid., p.126.*

" No tool can improve a poor design, but the computer can make a good designer better by making it easier to explore more options, more fully. " [24]

[24] *Design Quality, p.114.*

Show

My original intentions for the thesis show were to display twelve 8"x10" color transparencies, plus one 2D printed poster application. I was not at all certain about what I would need to do in order to acquire or build a back-lit display for the transparencies. Two four-foot wall light box displays were loaned to me for the show. I was concerned about not having 8' of gallery wall space for my use. I had to change my mind on the transparencies due to expense. I decided to display just four transparencies, those being my application pieces. I felt that these would more closely represent what was on the computer screen in terms of color intensity. The other eight images would be shown as individual Reversal color prints. I chose the black mat to contrast with the dark, yet vibrant colors in the images.

Deciding what to do about the poster was my next priority. I was anxiously awaiting the poster's electronic assembly on the Scitex (R.I.T. School of Printing). I prepared my back up image –four color prints seamed vertically together just in case the Scitex poster did not materialize. The seamed poster was missing about 1/4" of information on both top and bottom of each image (due to processing); therefore, when vertically aligned, the seam information did not match. The Scitex process involved scanning my 35 mm color slides into the system for format, size, seaming and retouching. Next a chromalin proof was made. This image arrived and was hung the day before the show opening. It was small in size due to film size (15"x 6"). I was very pleased to hang this image. Some corrections could still be made in the seam areas.

The show went up relatively quickly with the only time consuming project being the encasing of the light box with black illustration board. I viewed these show pieces as successful because they displayed the best representation of output I could manage and a good representation of my thesis work.

Conclusion

Problems

Each image presented a challenge in its own way. Some I spent a lengthly amount of time setting up. I hadn't learned the short cuts until I worked on subsequent files. Other valuable time was misused on either relearning certain functions or improper file management. I found I didn't have enough time to summarize my journal, so I spent time repeating things needlessly (i.e., mistakes etc). Sometimes I was just too tired and accidentally deleted important files. I didn't have a strong background in illustration skills, so certain parts of my images were difficult to create. Only once did the "machine" ruin a disk. I did not lose that much time, yet, there is always the possibility that electronic information could become irretrievable for unknown reasons. Lastly, the room was a little too cold in temperature for me to comfortably work in.

Personal Gain

I was very pleased to have the opportunity to work on this thesis. I felt very strongly that computers should be explored to their fullest potential and more importantly that each type of machine should be used for its greatest potentials. Then everyone benefits – the user, its clients, artists and students, etc. I had fun working on this project. Some things still needed revision, but I was pleased to have explored so many options. I felt that I learned a great deal and hope this information will in turn assist someone else.

Conclusion

My suggestions for others interested in research areas would be: to compose complex imagery using the camera, or to work with typography. The strengths of this system are many. To name just a few:

1) Simultaneous use of both Paint and Vector Art
2) Special Effects included are: Grab, Wash, Mask, Rotation Font, etc.
3) Endless Raster Paint Effects: air brush, filter combinations, and multiple exposures, etc.
4) It allows for imaging to transfer between vector and paint in either direction.
5) Even with storage limitations complex imagery can be created.
6) High resolution color imaging can be created to communicate to various audiences.
7) Raster storage can be used to minimize the storage size of large groups of vector objects.

Things that someone should expect from this system with the current software:

1) No easy way to structure 3D imagery.
2) Paint resolution is 1000 lines.
3) Pre-film recorded imagery is 75% averaged, not real, causing softness.
4) Color memory per file is limited to 253.
5) Combination vector/paint files will be imaged at 1000 lines. The vector portion of the file can be imaged at a higher resolution providing a multiple exposure shot is done.
6) There is no color look-up table in the raster palette (not with a 24 bit system); therefore, setting up spreads and depositing color into specific locations can only be done in the display.
7) A one -pixel brush doesn't exist in the Paint Menu, it cannot be custom built.

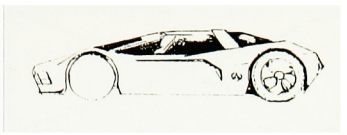
Tips

• For easy deletion of file information use:
PIP device:*.*;*/de

• For concise use of object art space, use a panel whenever possible, and build all sophisticated shades out of numerous object art groups sent to paint.

• For dimensional vector text use an object from a font rotation program, then distort it even more (i.e., grow it down vertically, etc.).

Illustrations



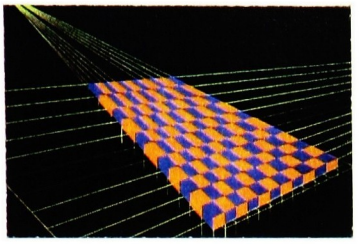
Artists Sketch
Car
David J.Wood
Norfolk,Virgina
January, 1989

Comprehensive
Application Poster

Thumbnail Sketch
Application Poster

Appendix

3D Grid



The following process is a simple technique to obtain a 3 dimensional looking grid in a 2D file. First draw lines out radially from a point, then group and space increment. Next on the y axis, create a second group overlapping the radial lines. Then space increment these vertically. Now delete lines from this top group in a progressive manner, keeping the lines closer at the most distant part of the grid, and farther away towards the foreground. This will make the grid appear to recede back into space.

Air Brush

In referring to this term I'm defining a generalized application of the paint menu. By this I mean paint being applied with a low intensity blend brush (1-3). This allows for a subtle color averaging, giving a soft blended look.

Anti Alias

"This technique involves using additional bit planes to supplement the basic image with an intermediate intensity representation, to improve the apparent smoothness of curves, or to shift pixel locations to minimize the "jaggy" effect of raster images."[25] It is most often used on diagonal lines, text, and curves.

[25] *John W. Seybold, The World of Digital Typesetting (Media, Pennsylvania: Seybold Publications Inc., 1984), p. 375.*

Bernoulli

Disk used for the storage of raster images on the 100 D+. It can store canvases, paint image files, and pre-film recorded files. Total storage space is 40, 000 megabyte, 20 each drive. It functions as part of the system hardware, and uses these devices: BL0, BL1, BL2, and BL3.

Canvas

This is a location on the 100 D+ where paint images are stored and panel windows are referenced to. There are three canvas locations per file A, B, C. When an individual canvas is stored to a disk it uses up one megabyte and stores each pixel location. Canvases are stored on the hard drive (TM) or onto Bernoulli disks (6-19 per disk).

Color

Color location on the 100 D+ is referenced in the following two ways. The vector display area finds its color in a color look-up table . This allows color to be adjusted quickly either visually or by referencing to the numeric value assigned to its hue, chroma and or value (i.e., clear black- hue 192, chroma 000, value 000). Two hundred and fifty-six color locations are stored per file. The raster or paint palette does not follow the same structure. It is arranged to follow unlimited color capability: each pixel is colored individually, allowing for 300,000 colors on the screen at any one time. The only way to simultaneously change a multitude of pixel color in a controlled way is to wash over those pixels with a chosen color and intensity.

Appendix

Digitizie

When referring to this term I mean grabbing through video any image which is then converted into electronic raster images. A raster image is composed of pixels, and must therefore be stored on a canvas.

Display

This term is used to describe the vector image area in a 100 D+ file. Objects in this file area are shapes whose outlines are composed of x,y coordinates. They can be viewed like flat pieces of paper stacked upon one another. Therefore, the display is an area where object (vector) art is created and stored. It is contains three pages.

Decoder

This is hardware that will take a signal from video and send it back into the computer.

Encoder

This piece of hardware will take a file from the computer console and transmit or convert the information into a video signal which can in turn be taped onto a video cassette.

File Management

In referring to this term I'm thinking of one of three areas:

1) Accurate storage, retrieval, and deletion of both old and new Efficient usage of object storage in both canvas locations and in the display areas.
3) Efficient usage of color allocation especially in the display areas where in any file maximum color usage is fixed at 253.

Filter Effects

26 Upgrade Product Video User Guide (Liverpool, New York: Genigraphics Corporation, 1986), p. 2 -9.

Red, Green, Blue filters allow for the grabbing of selected bits of a video image. Each color filter can be set between 0 and 8. The maximum and default setting is R -8, G-8, B-8. Special effects can be obtained very easily. Grabs can be done with various levels of color on top of other grabs or onto either a blank or flooded canvas.[26] Some specific effects are:

1) Posterization- Reduce color bits for each (i.e., R-3, G-3, B-3. Starting with a black canvas should give pastel color results.
2) Color Filtering- Elimination of one or two of the basic colors grabbed (i.e., R-8, G-0, B-0, resulting in red image).

Grab

27Ibid., p. 5-2.

Digitize an image through the Ikegami Video Camera into the Video Upgrade System. This is a video scanning, digitizing, and storage process that brings the existing image into the video up grade system using a 1/30 th second "flash scan" capability. It is best to grab images in the largest size possible to retain the most information. They can later be reduced in proportion.[27]

Appendix

Memory Models

A storage location for each letter form used while working with the font rotation software. I found that using 140 models would fill the available storage; therefore, lengthly words (7+ letters) could not be rotated more than twenty times.

Multiple Exposure

The multiple exposure of two slides occurs in the PS-2000 Film Recorder. These files must be set up in the following way in order for this to procedure to work. The art work on either file must not overlap; therefore, a black hole should be created wherever imagery will merge on the film. The color 192, 000, 000, clear black should be deposited on one of the files in areas where corresponding art appears on the others. The problems wiyh this process occur where curves or diagonals are found in an image. This is especially so for stair-stepped images in raster files. The final slide will have black outlines around all the multiple exposed curves or diagonals (due in part to the pre-film record process). The instructions for a multiple exposure are relatively simple. They tell the camera not to advance so images can be shot one upon another. The specific code for this is: /mx:yes, then list the files in the usual manner, and when finished turn off this function with /mx: no.

Object Art

This art work is created through mathematical computation. It can be point to point areas or lines, circles, rectangles, or panels. Each point or vertex has a specific x, y coordinate. This term is synonymous with vector art. The art is created and stored in the display's page areas. The advantages of object art are: its capabilities of high resolution output 2000-8000 line; its flexibility and accuracy of manipulation (color, positioning, size, and duplication); plus it can be transferred into raster art.

Output Resolution

Paint files are imaged at 1000 lines. Vector art at 2000 -8000 lines. Vector art will always be sharp providing it is not imaged as a pre-film recorded paint file. Multiple exposed files will shoot at 1000 lines for paint plus 2000 for the vector art providing that paint capabilities are disabled when the vector image is being shot. Paint files will always be soft due to the pre-film recording (75% of the image is averaged information).

Appendix

Panels

Panels are views through "rectangular" windows connecting the display to the canvas or vice versa. Panels created in the display (sketch menu) transfer to any size or position on any canvas. They become object art when transferred back to the display. They can be moved, grown, duplicated, grouped etc. Most importantly, they are a point to point rectangle allowing for manipulation (whereby corner vertices can be placed anywhere). Panels can be "cut " out of the display and pasted onto any canvas. Proportions can be adjusted while pasting, or later with a recut & paste onto any canvas.

Page System

The page system is part of the display area on the 100 D+. Each file of object art can use 1-3 pages for the placement and storage of objects. The pages have size, color (253), and memory model (140 max) storage limitations. The pages do not have to be full. They can be used to overlap art, page being the base layer and page three the top layer.

Pre-film Record

Information is scanned into a file at 486 lines across an image. Output devices with other than 486 lines of resolution must change the information to compose a slide. To fill in missing information between the scan lines the computer averages scanned pixel data causing the image to appear softened. Therefore, in a paint (1000 line) file 75% of the information is averaged. These files use up approximately 3 megabytes of space.[28]

[28] *Upgrade Product Video User Guide (Liverpool, New York: Genigraphics Corporation, 1986), p.1-9, 9-3,4.*

Point- to- Point Shape

Vertices define the parameters of these vector shapes (or lines).

Pixel

A rectangular unit of storage space in a raster image. Pixels are aligned in vertical and horizontal rows to create an image area. Individual pixels can be a different color which in turn composes imagery on a canvas.

Raster Image

Synonymous with Pixel Art (also paint box or paint imagery). Images composed of horizontal and vertical rows of rectangular storage units called pixels. Each pixel can be a different color. It is the arrangement of colors that define an image. The advantages to pixel art is found in: its ability to store or compose digitized /grabbed imagery, also in its subtle paint capabilities.

Appendix

Space, Size Increment

This is a function of the object art menu where group members can be proportionally spaced from location to another while being simultaneously proportionally sized from one size to another.

Space Color

This is a function of the object art menu where group members can be unlinked in color allowing a color spread to occur from the top object to the base, light to dark, or vise versa. There are three types of color spreads: HVC (hue, chroma, value, gives spectrum), RGB (red, green, blue, subtle, intensity decreased) and SPC (general spread).

Vector Objects

See object Art p.23.

Wash Technique

This function applies colors from the display over a reference rectangle area onto the active canvas. Multiple layers of wash can be deposited at various intensities. This is a good way to consistently and relatively quickly change colors or gain control over many pixel locations. To change a gray marble canvas to blue, wash over it with the same size blue rectangle (located on the display). Object art files can be washed into canvases. See the transparency file on p.13. Washed files are extremely dense and slow to pre-film record.[29]

[29] *Upgrade Product Video User Guide (Liverpool, New York: Genigraphics Corporation, 1986), pp. 2-7.*

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